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1 WHAT IS EDUCATIONAL RESEARCH?

STUDENT LEARNING OBJECTIVES

After studying Chapter 1, students will be able to do the following:

1.1 Name and describe four methods that can be used to seek out answers to important questions.

1.2 Describe the scientific method and how it can be applied to educational research topics.

1.3 Summarize characteristics associated with educational research.

1.4 List and describe the major steps of the educational research process and identify various methods for conducting educational research.

1.5 Articulate the importance of exploring research in your specific discipline.

1.6 Evaluate the perceived importance of educators' conducting their own research.

INTRODUCTION

Whether we realize it or not, research is—and should always be—central to how we function as a successful and productive society. Whether we consider history, medicine, social group dynamics, or psychology, regardless of our areas of study or interest, research is the key to answering our questions, solving our problems, and fostering creativity, innovations, and advancements. Research in the broad field of education is certainly no exception to this fact.

FINDING ANSWERS TO QUESTIONS

The basic goal in nearly all research studies is to find answers to particular questions. These may be questions about students, teachers, curriculum, attendance, graduation rates, extracurricular activities—the list is seemingly endless. Human nature characteristically prompts us to try to find answers to our questions as quickly as possible. As human beings, however, our general method of thinking tends to be flawed. Tom Kida (2006) identified several common mistakes we tend to make in our thinking:

We tend to prefer stories to statistics (and research). Because we are social beings, we like to feel connected to others, and stories tend to facilitate those kinds of connections. Even if presented with convincing statistics, we tend to gravitate to someone telling a seemingly sincere story—even if it is not accurate—because it "tugs at our heartstrings."

We seek to confirm our ideas, not to question them. Generally speaking, everyone likes to be right, and few of us like to be wrong. When people search for "evidence" to solve a problem, they tend to focus on information which confirms—not contradicts—their beliefs.

We sometimes misperceive the world. Oftentimes, we see what we want or hope to see, and not that which may actually exist.

We tend to oversimplify our thinking. Our reality—especially as educators—is extremely complex. We constantly need to analyze complex events that we observe in our classrooms and schools. If we do not simplify our observations, we can become overwhelmed trying to make sense of the world around us.

Our memories are often inaccurate or distorted. With all of the factors and variables that we observe on a daily basis, the passage of time reduces our abilities to accurately remember many details of these events.

It follows, then, that the sources we pursue for possible answers are typically those that are most convenient to us. These sources include tradition, authority, and common sense. *Tradition* refers to how we

have historically sought answers to our questions. For example, suppose that the Adams School District developed an innovative science curriculum 25 years ago. It was very well received at the time of its inception, both locally and statewide—so much so that several other districts developed similar curricula. However, the topic of revising that curriculum was recently raised in a science committee meeting. During the discussion, several committee members explained how innovative the curriculum was when it was originally developed and so why should they now want to abandon something so innovative. The general consensus of the committee was that the science curriculum was great when it was developed and has been working fine since then—so why change it? This argument may be correct; however, a good deal of time has passed and numerous scientific advances have been made since the curriculum was originally implemented. While it may have been effective for Adams' students in the past, it may not be appropriately meeting their academic needs now. Relying on the "it worked in the past, so why change now" attitude might lead us to inaccurate answers to our questions about the appropriateness of the curriculum.

If tradition fails to provide us with suitable answers to our questions, we next look to *authority*, by seeking answers and opinions from individuals who have substantial expertise in the field and who, we hope, know what is best for us. This source remains very popular in the broad field of education and can be highly effective. However, its effectiveness in terms of answering our questions is not always a certainty. Consider the numerous "bandwagon" movements that schools have jumped on over the years. When it turns out that these are not effective solutions to our school-based problems, schools jump off of them almost as quickly as they jumped on, usually in search of a different "quick fix." To work effectively, authoritative answers to our questions must be "customized" to fit the specific needs of the target school, district, or setting. This approach can certainly prove effective, but it does not routinely occur. In many instances, experts simply try to apply their answers to our questions, regardless of our specific situations, conditions, demographic makeup, and so forth. In these cases, authoritative answers typically prove ineffective. For example, what might prove an effective solution in the Adams School District might not be as effective in the Brighton School District, and could even be a miserable failure in the Crestview School District.

If traditional and authoritative approaches to answering our school-based questions do not prove to be effective, we might decide to take matters into our own hands. After all, who knows the specific needs of our district, and our students, better than we do? Using the *commonsense* approach of human reasoning—sort of figuring things out on our own—can be highly effective. However, common sense can be effective only if the information on which solutions are developed and decisions are based is reliable and accurate. For example, consider all the advances in medicine and technology over the past decade—and the numerous failures that often preceded those successes. (Please note that I am using the term *failures* very loosely because if we learned something that ultimately benefits us in the long run, then it was not a failure, in the literal sense of the word.)

In actuality, both tradition and authority can provide additional information and guidance, should we decide to use a commonsense approach to answer our questions. Personal experiences and expertise provide great insight to help us answer our questions, but those sources of information may be biased or incomplete; they are simply not enough. We still need information—reliable and accurate information—to help guide our approach to seeking out answers to our educational questions. Where do we find this reliable and accurate information that can serve as a basis for answering our questions? This type of information must come from a process that is both systematic and objective—and that reflects a greater level of critical thinking—thus providing us with information that is accurate and meaningful, and not distorted or biased (to the extent possible). This approach is best accomplished through the application and use of the *scientific method*.

THE SCIENTIFIC METHOD

The **scientific method** is a specific strategy used to answer questions and resolve problems. It is very likely that you remember the scientific method from a junior or senior high school science course when you were required to complete some sort of research study in the form of a science fair project. The origins of the scientific method date back to 1938, when American philosopher John Dewey described the process as a procedure for thinking more objectively (meaning that the results or answers are not influenced by

personal feelings or opinions when considering and representing facts). The scientific method consists of a systematic, step-by-step set of procedures that are employed to objectively investigate some sort of phenomenon and then to answer specific questions about it. Dewey presented the process in the following steps:

1. Clarify the main question inherent in the problem.
2. State a hypothesis (i.e., a prediction of a possible answer to the question), OR develop an inductive focus (i.e., to help better understand a social problem).
3. Collect, analyze, and interpret information related to the question, such that it allows you to provide an answer to that question.
4. Form conclusions derived from the interpretations of your analyses.
5. Use your conclusions to verify or reject your original hypothesis.

The scientific method is essentially the process used in conducting a vast majority of research studies. However, it is important to realize that this is a "generic" set of steps and that all research studies may not follow these steps to the letter, or necessarily in this order. This is often the case for many types of qualitative research studies. In situations where research studies do not follow the steps exactly, they still share a couple of important concepts in common. First, all research studies clearly specify a research question that serves to guide the conduct of the study, although some studies do not have those questions developed until after the study has begun. Second, all research studies include the collection, analysis, and interpretation of information. Applying the scientific approach to this second set of activities is what enables us to answer our questions more objectively or more accurately.

How, then, is the scientific method related to research in the broad field of education? In actuality, there is a great deal of overlap between the two. Simply put, **educational research** involves the application of the scientific method to educational topics, phenomena, or questions. The generic steps in the process of conducting educational research are as follows:

1. Specify the topic where a concern exists.
2. Clarify the specific problem to focus the research.
3. Formulate research questions or hypotheses concerning the specific problem or topic.
4. Review existing literature related to the topic or problem.
5. Specify and conduct procedures by which data (a more appropriate term for "information") are collected.
6. Specify and conduct procedures by which data are analyzed and interpreted.
7. State the findings that are generated as a result of the analysis of data.
8. Draw conclusions related to the original research questions or hypotheses.

Note the similarities between Dewey's steps of the scientific method and the steps involved in conducting educational research. The major, integral components are common to both lists. However, to reiterate, these steps do not always occur in practice as they are presented here, nor do they always follow this particular sequence—especially with respect to specific types of educational research, namely those that use qualitative methods.

EDUCATIONAL RESEARCH—WHAT IT IS AND WHAT IT IS NOT

Although educational research can be a fairly straightforward process, some educators have preconceptions—or, perhaps more appropriately, misconceptions—about exactly what constitutes educational research. To fully appreciate the potential benefits of educational research—both as a researcher and

a consumer—it is critical to have a foundational understanding of it. The following list—partially adapted from Leedy and Ormrod (2019)—is an attempt to describe what educational research *is* and what it *is not*.

Educational research is scientific. As a process, educational research is a scientific endeavor. As we previously discussed, educational research closely parallels the scientific method; however, labeling it a "scientific process" goes even further. To say that educational research is scientific is to say that it is characterized by the principles and methods of science and that it is systematic and methodical. As you see later in this list, educational research is objective and open-minded about the topic being studied. The overall process, when followed appropriately, involves a step-by-step methodology that ensures this high level of systemization and objectivity.

Educational research begins with a question or problem that serves as the purpose or goal of a study. Schools abound with problems that need solving and questions that need answering—just ask any teacher or administrator. The logical starting point for any research study in education is to clearly articulate the question you ultimately want to answer or the problem you ultimately want to address. In turn, this provides a clear direction for the study—everything that follows, in terms of the development of your study, logically relates directly back to the question or problem. Furthermore, by brainstorming various questions and problems to address, we typically identify even more concerns that require our scientific attention. Clearly stating these questions or problems is the first formal step to conducting educational research.

Educational research requires the formulation of a specific plan for conducting the research. Once the inherent question or problem has been specified and clarified, one must develop a plan for just how to conduct this research. The data necessary for answering the question or addressing the problem do not miraculously emerge out of thin air for the educational researcher to take and run with. The entire study must be well planned and carefully thought out, prior to its inception. These are the types of decisions and plans that must be made in advance:

- Who will you study?
- How many individuals will you need—or do you want—to study?
- What information will you collect from them?
- How will you collect those data?
- When will you collect those data?
- What will you do with (i.e., how will you analyze) those data once you have them?
- How do you plan to interpret the results of those analyses?

All these methodological issues must be addressed at the outset of any research study. For reasons we discuss later in this book, these types of decisions simply cannot be made "on the fly," in the midst of the research process.

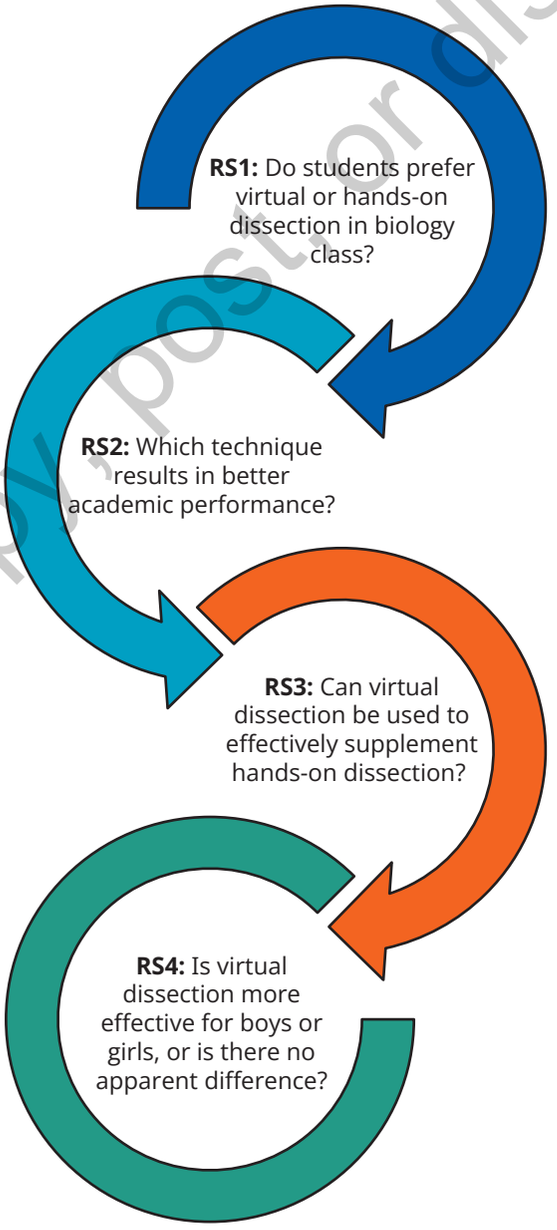
Educational research requires the collection, analysis, and interpretation of data as a means of answering the inherent question or problem under investigation. For many novice researchers, this part of the process of doing educational research—collecting, analyzing, and interpreting data—often proves to be the most daunting. However, the more attention paid to these steps of the educational research process, the better the quality of the research study's ultimate outcome. In some cases, research studies involve the collection of existing data (e.g., school attendance records or standardized test scores), but they most often require the collection of original, new data (e.g., surveys, interviews, or pre- and posttests) specific to the research questions the study is addressing. Regardless of the source of the data, it still needs to be analyzed (with the perspective of the research question or problem in mind) and interpreted appropriately. This is a commonality across all educational research studies.

In most cases, educational research tends to be cyclical or helical, as opposed to linear. When we look at the specific process of performing educational research in Chapter 2, it appears as if it is a linear process. In other words, Step 1 is followed by Step 2, which is followed by Step 3, and so on until the research concludes. While this is accurate (to a degree), research seldom, if ever, stops at the end of this

process. Often, conducting educational research in an effort to answer one or two pressing questions results in the generation of new, additional research questions—and typically a greater number than you started with. Therefore, it is probably best to view educational research as cyclical (i.e., with cycles of research studies that explore the same basic topic in subsequent years or classrooms) or even helical (i.e., with a spiraling effect, where the original research study spawns additional, follow-up, or extended studies addressing different aspects of the same broad topic). This is, perhaps, one of the most unique aspects of educational research—that it is never truly done and that one can continually investigate educational phenomena.

Figure 1.1 presents a scenario where a science department might want to investigate the benefits of a virtual dissection (e.g., using an iPad app) versus the more traditional, hands-on method. In Research Study 1 (RS1), the question focuses on the students' preferences for the two types of laboratory activities. The next study (RS2) focuses not on opinion or preference but, rather, on academic performance. RS3 investigates the use of the virtual dissection as a means only to supplement, not replace, the hands-on activity. In RS4, the department might now want to know if there is a difference—in terms of both

FIGURE 1.1 ■ The Cyclical or Helical Nature of Educational Research



preference and academic performance—between boys and girls in their use of virtual and hands-on dissections. In this scenario, notice (1) how the same broad topic is being investigated in all four studies, but also (2) that different aspects of that topic serve as the focus (i.e., the guiding research question) for each subsequent study.

Educational research is, by its very nature, inquisitive, objective, and original. Because educational research is scientific, it must be approached from the perspective of objectivity. The goal of any research study (regardless of the field of study) is the generation of new knowledge, the gaining of a better understanding of some issue or phenomenon, or the development of some sort of innovation. This simply cannot be accomplished if the researcher is biased or approaches a research study with some degree of subjectivity. That being said, it is critical to note that, as human beings, we all possess certain biases—for example, with respect to our view of the world, toward certain people, and even in our perspective on research. Human nature dictates that we always have some sort of preconceived idea (i.e., *bias*) about what we may find as the result of any given research endeavor; however, the goal when conducting research in education is to *make every effort* to avoid the temptation to let those preconceptions guide how we conduct the study or interpret our results. Building on the previous example, I may honestly think that virtual dissection is preferred by students and results in better academic performance; however, I still collect opinion and performance data from students on both virtual *and* hands-on dissection activities. This, in turn, allows me to objectively answer my guiding research question about which learning activity is better.

Educational research should be beneficial, meaningful, and significant. Topics or questions that are trivial in their nature should not be the focus of educational research studies. Educational research should be conducted so the results prove beneficial to someone, somewhere, somehow, someday. If you want to study something that will not potentially result in one or more of the aforementioned benefits, then I would strongly advise you to rethink your research topic. Educational research should be done to garner new knowledge and to shed light on the human condition and educational phenomena. It should never be conducted as a means of doing harm to individuals or groups, or to denigrate, cast blame, find fault, deny opportunity, or stifle progress. The goal of the educational researcher is always to increase understanding and, whenever possible, to promote opportunity and advancement for the population at large.

Equally important, educators should understand what educational research *is not*.

Educational research does not have outcomes that are predetermined. Following logically from an earlier bullet point, educational research does not pursue questions that either (1) have already been answered or (2) have a predetermined, desirable answer. This is an essential difference between *science* and *pseudoscience* (Johnson, 2013; Mertler, 2020). Science—and inquiry that results from the application of the scientific method—relies on perceived reality (typically in the form of collected data) to determine beliefs. In other words, and as we have seen, data are collected and analyzed to determine what is believed. In contrast, pseudoscience uses beliefs to determine perceived reality. That is, one begins with a strong belief and seeks out data that can be used to support that belief (Johnson, 2013). Pseudoscience is often used as a marketing tool by companies to sell products or by individuals or groups in attempts to demonstrate that their ideas, methods, or products are the most effective. Clearly, this approach is not systematic, nor is it objective, and it does not use the scientific method. Therefore, it is not science . . . and it is not research (Mertler, 2020).

Research is not simply gathering information. When I was in the eighth grade, I did a research project on UFOs. I spent months reading books and articles with firsthand accounts of alien abductions, taking notes on 3 × 5 note cards, developing an outline, and then finally writing my research report. I learned a great deal in completing that project—not just about UFOs, but also about organization, time management, and writing skills. It was a great learning experience; however, it was not "research." My overall experience and final report were not very *inquisitive*; I did not have any sort of clear and focused guiding question I was attempting to answer. They certainly were not *original*, since all I was

really doing was collecting and organizing previously published stories and accounts. I might even argue that they were not objective, since I "captured" only one side of the story (i.e., information that supported the existence of UFOs). What I did was gather a lot of disparate information from a wide variety of sources and compile it into a cohesive written report—good work, but clearly not research.

Educational research is not conclusive. As we discussed, educational research often generates more questions than were initially intended to be answered. In that sense, educational research is never conclusive. Perhaps more important, however, educational research typically involves the study of human beings and their behavior. The behavior of human beings is constantly in flux, changing in reaction to internal influences (e.g., age, natural growth and development, psychology, physical health, mental health) as well as external stimuli (e.g., technology, peers, family, teachers). What we research and conclude one day could easily change the next day if we study it in a different setting, with different students, teachers, curricula, classrooms, interpersonal relationships, and so forth. Along similar lines, the answers to the questions that guided our research should never be interpreted as right or wrong. Rather, they are answers appropriate for the given time and set of circumstances, including the particular data that were collected and analyzed.

Educational research is not trivial. Over the past several years, there has been increased focus on the implementation of research-based strategies geared toward improved student performance. Research plays a very important role in today's educational climate, as well as in various school reform movements that we observe across our country and around the world. It is critical that educators at all levels see research as having substantial value for their practice, both individually (i.e., in their respective classrooms) and collectively (i.e., for the profession as a whole).

EDUCATIONAL RESEARCH AS A PROCESS

Earlier in this chapter, we discussed that educational research is a process, one that parallels the scientific method. Before we take a look at the specific process, we need to understand some of the guiding principles behind conducting research in education. The primary goal of nearly all educational research studies is "to describe, explain, predict, or control [educational] phenomena" (Mills & Jordan, 2023). This is the case regardless of the particular methods used to conduct the research (i.e., the techniques used to collect and analyze data). However, different research methods can produce different views of reality. The various research methods tend to be placed Into two broad categories—quantitative approaches and qualitative approaches—based on different assumptions about how best to understand what is true or what constitutes reality (McMillan, 2016). Quantitative research methods require the collection and analysis of *numerical* data (e.g., test scores, attendance records, attitude scales, interest inventories); qualitative research methods require the collection and analysis of *narrative* data (e.g., observation notes, interview transcripts, journal entries).

Quantitative research methods use a deductive approach to reasoning when attempting to find answers to a research question. **Deductive reasoning** works from more general, broad-based ideas, concepts, observations, or experiences to the more specific, in a "top-down" manner (see Figure 1.2). Notice that as one proceeds through the research process, there is a general funneling (i.e., narrowing) effect. As a purely hypothetical example, researchers conduct a survey of 1,500 educators regarding their opinions (i.e., *variety of data*) on the Common Core State Standards (CCSS). Those responses and opinions are aggregated, examined, and evaluated (i.e., *analyses of the data*), and it is determined that 65% of the respondents think that the CCSS standards are beneficial for students and 35% believe that they are not (i.e., *specific conclusions*).

On the other hand, qualitative research methods use an inductive approach to resolving problems and answering research questions. **Inductive reasoning** works in a "bottom-up" manner, opposite to the direction used in deductive reasoning, and involves the development of broad, general conclusions from observations of a very limited number of events or experiences (see Figure 1.3). To build on our hypothetical example, imagine that a team of researchers observes a small group (i.e., three to four

FIGURE 1.2 ■ The Process of Deductive Reasoning, as Applied to the Research Process

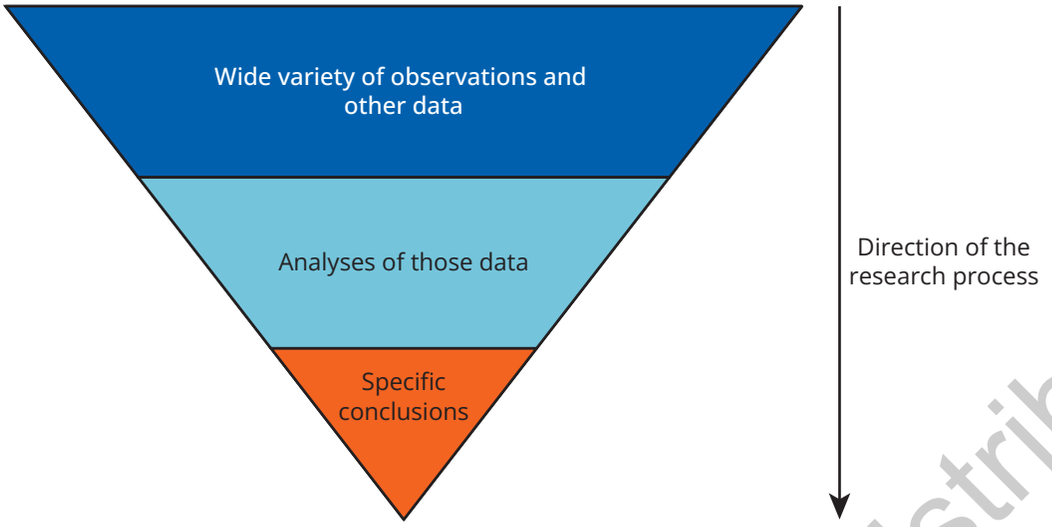
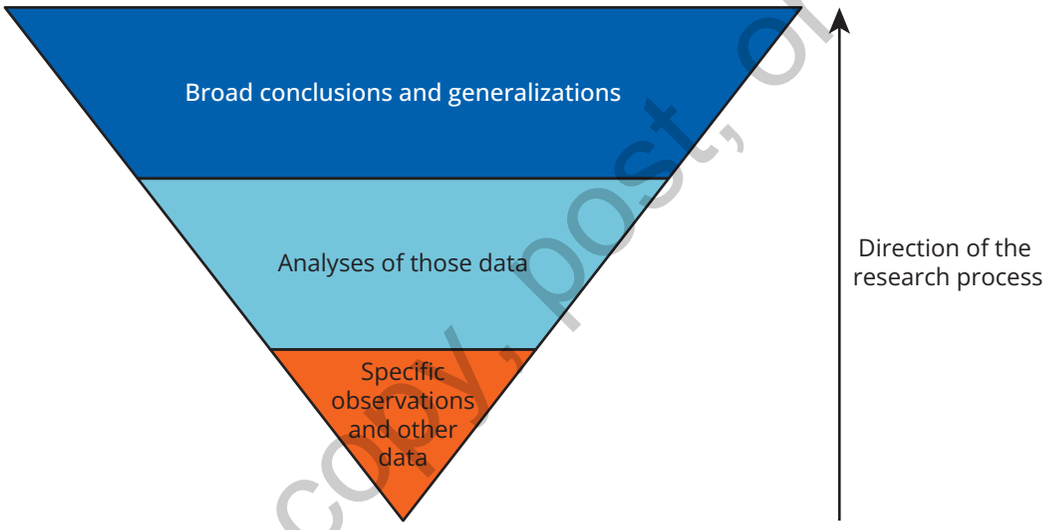


FIGURE 1.3 ■ The Process of Inductive Reasoning, as Applied to the Research Process



teachers) over the course of two months to see how implementing CCSS has (or has not) changed their instructional practices. Once the researchers compiled their observation notes (i.e., *specific observations*) and examined them for any emergent themes or patterns in behavior (i.e., *analyses of the data*), they develop broad conclusions, hypotheses, or theories about teachers' instructional practices and the influence of CCSS (i.e., *broad conclusions*).

To accomplish the primary goal of a quantitative educational research study, researchers collect data on carefully identified **variables** (i.e., factors that may affect the outcome of a study or characteristics that are central to the topic or problems being addressed). Those data (by the way, the word *data* is always plural) are then analyzed and the results interpreted to test **hypotheses** (i.e., predicted outcomes of the study) or answer **research questions** (i.e., guiding questions that serve as the focus of the study). For example, a quantitative research study might require the collection of data on elementary school discipline referrals and absenteeism (numerical variables) to answer the following research question: Are there differences in the rates of disciplinary problems and absenteeism in schools with a K–8 grade span versus those with other grade span configurations (e.g., K–6, 6–8) (Mertler, 2020)?

The plan that is used by the researcher to carry out the study is referred to as the **research design**. Quantitative research designs are either nonexperimental or experimental. In **nonexperimental research**, the researcher does not have direct control over any variable in the study, either because it has already occurred or because it is not possible (or, perhaps, ethical) for it to be influenced (Mertler, 2020). Another way of saying this is that, in nonexperimental research, variables cannot be controlled or manipulated by the researcher. The previous illustration of a study of school discipline and absenteeism problems is an example of a nonexperimental study, as the type of grade configuration, the number of discipline referrals, and the number of absences cannot be controlled or influenced by the researcher; those things occur naturally or have already occurred. That variables cannot be controlled in nonexperimental studies is an important distinction between nonexperimental research designs and experimental research designs, in particular when it comes to stating specific conclusions at the end of a study. This usually means that the conclusions to nonexperimental studies are able only to describe variables or the relationships between variables. Some examples of nonexperimental research designs include *descriptive, comparative, correlational*, and *causal-comparative* research (McMillan, 2016).

Descriptive studies are more basic, in that they simply report information—resulting from the collection of empirical data—about the frequency or amount of something (e.g., what percentage of the time do teachers use performance-based assessments in their classrooms?). **Comparative studies** build on descriptive studies by comparing two or more groups on one or more measured variables (e.g., is there a significant difference between elementary and secondary teachers' use of performance-based assessments?). **Correlational studies** measure the degree and nature of the relationship between two or more variables (e.g., what is the relationship between years of teaching experience and use of performance-based assessments?). Finally, **causal-comparative studies** (also sometimes referred to as **ex post facto studies**) compare groups—where group membership is determined by something that occurred in the past—on subsequent data on another variable in such a way that it makes it possible to draw potential causal relationships between the two variables (e.g., do teachers who completed a standalone preservice course in classroom assessment use performance-based assessment more than teachers who did not complete such a course?). Notice that based on the sample research questions provided, it is quite possible to use any of the various types of nonexperimental research designs to study a given topic—in this case, classroom teachers' use of performance-based assessments (Mertler, 2020). Also, as we previously discussed, it is important to note in the preceding sample research questions the helical nature (i.e., varying research questions or studies on the same general topic) of educational research.

Generally speaking and contrasted with nonexperimental research, in **experimental research**—which also includes **quasi-experimental designs**—the researcher has control over one or more of the variables included in the study that may somehow influence (or cause) a participants' behavior. The variables over which the researcher has control are known as the **independent variables**; these are the variables the researcher manipulates, meaning that the researcher determines which participants in the study will receive which condition (Mertler, 2020). For example, if the effectiveness of a new reading comprehension program (focused on the integration of annotation into the reading process) was being investigated, those students exposed to the *new* program incorporating annotation would constitute the **experimental or treatment group**; their performance would be compared with a **control group** that receives the standard reading instruction (i.e., with no annotation skills being taught, practiced, and reinforced). The ultimate variable of interest (i.e., the "behavior" variable mentioned earlier, perhaps "achievement in reading comprehension" in our example) is referred to as the **dependent variable** (since its value *depends* on the value, or group membership, of the independent variable).

Experimental research designs come in a wide variety, which we discuss later in Chapter 7. However, a concrete illustration of an experimental research study might prove beneficial, at this point. Suppose a history teacher wants to determine whether students perform better when taught American history using the more traditional forward (i.e., past-to-present) approach versus a backward (i.e., present-to-past) approach (Mertler, 2020). The teacher randomly assigns half of their class periods to be taught using the forward approach and the other half to be taught using the backward approach. The independent variable for their study is "the type of instruction." There are two *levels* to this variable (these two levels essentially "define" the two groups): The experimental group receives the innovative backward approach to instruction; the comparison group receives the more traditional forward approach. Finally,

the academic performance (dependent variable) of all students is measured using the same instrument (e.g., a final exam) for both groups. The aspect that makes this study experimental in nature is that the teacher themself determines which group receives which version of the treatment (i.e., instruction); in other words, the teacher is *manipulating* or *controlling* the independent variable.

Data collected during quantitative research studies are numerical and are therefore analyzed statistically. Statistical analyses may include the use of descriptive statistics, inferential statistics, or both. **Descriptive statistics** enable researchers to summarize, organize, and simplify data. Some specific techniques include statistics, such as the mean, median, mode, range, standard deviation, correlations, and standardized scores. **Inferential statistics** are more complex and permit researchers to test the statistical significance of the difference between two or more groups, or the degree of relationship between two variables. **Statistical significance** refers to a decision made from the results of statistical procedures that enable researchers to conclude that the findings of a given study (e.g., the size of the difference between two groups or the strength of the relationship between two variables) are large enough in the sample studied to represent a meaningful difference or relationship in the **population** from which the **sample** was drawn (Mertler, 2020). You learn much more about statistical analyses in Chapter 13.

While quantitative research studies focus on a small number of variables, qualitative research studies use a more holistic approach to data collection. Qualitative research designs make use of systematic observation to gain knowledge, reach understanding, and answer research questions. In qualitative research studies, there is no attempt to control or manipulate any variable; researchers simply take the world as it exists and as they find it (Johnson, 2013). Qualitative research tends to emphasize the importance of multiple measures and observations. Therefore, the research questions—or associated problems that guide qualitative research—tend to be broad and open-ended. This allows the researcher to collect a wide variety of data for the purpose of getting a more holistic picture of the phenomenon under investigation, and allows for triangulation.

Triangulation is a process of relating multiple sources of data to establish their trustworthiness or verify the consistency of the facts while trying to account for their inherent biases (Bogdan & Biklen, 2007; Glesne, 2014). It is important to note that conducting triangulation does not necessarily mean that the researcher is using three (as in *tri-*) sources of data; it simply means that there is more than one source of data. Perhaps a more appropriate term would be *polyangulation* (since the prefix *poly* is defined as "more than one or many"; Mertler, 2020). This process of relating various sources of qualitative data enables the researcher to try to get a better handle on what is happening in reality and to have greater confidence in research findings (Glesne, 2014). For example, in a qualitative study, one might collect data through firsthand observations, videotaped observations, and interviews. Triangulating different sets of data from these sources requires them to be examined to determine, for example, if the behaviors exhibited and comments made by participants are consistent regardless of the type of data representing them. In other words, did a specific person act the *same way he said he acted*, or did he *verbally portray his behavior differently* from his actual behavior?

Similar to quantitative research, there are a variety of qualitative research designs, including phenomenology, ethnography, grounded theory, and case studies (McMillan, 2016; Mertler, 2020). **Phenomenological studies** engage the researcher in a—sometimes lengthy—process of individual interviews in an attempt to fully understand a particular phenomenon (e.g., What characteristics do teachers need to be viewed as compassionate by their students?). **Ethnographic research** describes social interactions between people in group settings (e.g., What meaning does the teachers' lounge have for the staff at Main Street Elementary School?). **Grounded theory research** attempts to discover a theory that relates to a particular environment (e.g., What types of personal and school characteristics serve to motivate teachers?). Finally, **case studies** are in-depth studies of specifically identified programs, activities, people, or groups (e.g., What is the nature of the school culture at Washington Middle School?).

The data collected during a qualitative research study may be quite diverse. Recall that qualitative data are typically narrative and consist primarily of observations, interviews, and existing documents and reports (McMillan, 2016). Resulting qualitative data are analyzed by means of a process known as **logico-inductive analysis**, a thought process that uses logic to make sense of patterns and trends in the data (learn more about this analytical process in Chapter 11).

While quantitative and qualitative approaches to conducting research are quite different on a variety of levels, they should not necessarily be considered mutually exclusive. It is not uncommon to see research studies, particularly in educational settings, that employ both types of research data. These types of studies are referred to as **mixed-methods research designs**. The combination of both qualitative and quantitative data tends to provide a better understanding of a given research problem rather than using one type of data in isolation. Perhaps the most appropriate way to think about mixed-methods designs is that these types of studies capitalize on the relative strengths of *both* quantitative and qualitative data. Creswell and Plano Clark (2017) considers mixed-methods designs and **action research studies** to be very similar to each other, since they both often use quantitative and qualitative data. The only real difference between the two is the underlying purpose for the research. The main goal of mixed-methods studies is more traditional (i.e., to better understand and explain a research problem); the main goal of action research is to address local-level problems with the anticipation of finding immediate solutions. You learn more about mixed-methods designs and action research in Chapters 8 and 9, respectively.

Now that we have a better grasp on some of the foundational aspects of educational research, consider a concrete example of the process of conducting an actual study. Remember that educational research is typically carried out as a process—that parallels the scientific method—using the following steps.

Step 1: Identification of an Existing Problem

An educational concern is identified for which there is no obvious answer. The concern may have arisen because of an identified need, an interest, a requirement, or a commissioned work, and may have been present for a long time or surfaced unexpectedly. For example, teachers in the Adams School District recently identified a disturbing pattern of academic achievement in their schools—students from certain cultural and racial groups seem to progress more rapidly than others, despite the educators' efforts to provide equal educational opportunity for all. Initially, they can offer no substantive explanation for the occurrence, nor are they sure about which groups are performing differently.

Step 2: Clarification of the Specific Problem

Simply knowing that some student groups perform differently than others in some academic areas is not focused enough to guide a research study. The initial concern must be clarified and stated more succinctly, after which it becomes known as the **research problem**. In the case of the Adams School District, and on closer examination of existing data, teachers and administrators determine that there is a noticeable difference in academic performance in Algebra I courses, although they still are unsure as to why the difference exists. They decide to formally state their research problem as follows: *There is a differential level of academic achievement, as evidenced by scores on the state's end-of-course (EOC) exam in Algebra I, between various racial groups of students*.

Step 3: Formulation of the Research Question(s)

Now that the problem has been clearly identified, one or more research questions must be formally stated to provide specific direction for conducting the research study. In other words, the goal of this study is to answer that research question. In the case of student performance in Algebra I, the educator–researchers in the Adams School District state their research question as follows: *Is there a significant difference in Algebra I EOC scores based on students' racial classifications? If so, which racial groups outperform others?*

Step 4: Review Existing Research Literature Related to the Topic

The educators acknowledge that there must exist some previously conducted research on this topic. In order to learn more about what was researched, how it was researched, and what was concluded from those studies, they conduct an extensive review of existing research literature related to their topic of racial differences in Algebra I content and skills mastery. To learn more about their topic, they decide to broaden their search for literature to include various demographic group differences found in relation to student performance in mathematics.

Step 5: Development of Procedures for Data Collection

When developing procedures for the collection of data, care must be taken to ensure that the data collected will "match" or "align with" the research question(s). If this does not occur, then it is difficult, if not impossible, to accurately answer the research question at the end of the study. At the risk

of oversimplifying our sample study, the research question necessitates collecting data on (1) students' racial categorization and (2) EOC test scores.

Step 6: Specification of Procedures for Data Analysis

Similarly, alignment between data analysis techniques and the original research questions must be ensured. Otherwise, you have results of your data analysis, but it does not provide answers to your question, which defeats the purpose of the research in the first place. Since our teachers and administrators are looking to compare students based on racial groupings, they can use a data analysis technique that focuses on group comparisons, for example a *t*-test or ANOVA (you learn more about these techniques in Chapter 13).

Step 7: Statement of the Findings Resulting From the Analyses

Once the results of data analysis are obtained, the most straightforward way to state the findings is to use the results to provide a specific answer to the research question. Teachers and administrators in the Adams School District are able to use the results of their data analyses to determine that there is, in fact, a difference in Algebra I EOC performance based on racial classification. They also can determine which racial groups scored higher than others. In other words, they have successfully answered their research question as a result of conducting the study.

Step 8: Development of Conclusions and Recommendations Related to Question(s)

Once the research question has been answered, educator–researchers must then use that information to draw conclusions about the original problem that was identified and make recommendations about what to do in the future. This is the step that typically leads to the development or generation of additional research questions that build on the results of the current research study. Returning to our example, the Adams School District may now want to seek answers to one or more of the following questions (among many other possibilities):

- What impacts on instructional methods result from some students outperforming others in the Algebra I EOC test?
- Are some students or sections of Algebra I taught differently?
- Are different teachers presenting the content and reinforcing mathematical skills differently?
- To what degree is this differential level of performance based on whether the Algebra I class takes place in the morning versus the afternoon?

In summary, the educational research process typically includes the following activities:

- Identifying an existing problem
- Clarifying and specifying the problem
- Formulating research questions concerning the central problem
- Reviewing existing research literature related to the topic
- Determining and carrying out procedures for data collection and analysis
- Stating the findings as determined through data analyses
- Developing conclusions and recommendations related to the original research question

KNOWING YOUR SPECIFIC DISCIPLINE

One of the best things you can do to begin preparing yourself to become both a researcher and a critical consumer of research is to familiarize yourself with your own specific discipline(s). Regardless of whether you plan to become a practitioner or a researcher in the future, knowledge and understanding of the research process, research methods, and appropriate ways to collect and analyze different types of data are essential *and critical* skills for keeping up with advances in your field (Leedy & Ormrod, 2019).

These skills are crucial in guiding your ability to make accurate, well-informed decisions in your practice as a professional educator. Failure to gain *and* master these skills can only result in professional decisions based on faulty data, inappropriate interpretations and conclusions, or unsupported personal intuitions (Leedy & Ormrod, 2019).

One important way for you to become knowledgeable about your field is to read articles and other publications relevant to your academic discipline. As an educator, your "academic discipline" can be defined in many ways. You might read articles related to the subject matter you teach, or to the age or grade level you teach; perhaps you read articles about education in general; you might also read articles that address education policy or educational leadership—the list goes on and on and on. Along those lines, finding such articles and publications is not as difficult as you might think. A logical starting point is with your professors, who can suggest journals that are particularly relevant to your field of study. Once you have a list of such journals, simply begin by browsing their tables of contents for articles that might grab your attention.

One additional piece of advice as you begin to explore research in your field is that you must be able to discern the general quality of the articles or publications you choose to read. One way to do this is by focusing your attention on research studies that have been refereed. A **refereed research report** is one that has been subjected to a review by colleagues and experts in a particular field. For the report to be published, it must be deemed by experts in that particular field to be of reasonable quality. This is not to say that nonrefereed reports or articles cannot be beneficial or meaningful to you in your practice as a professional educator; the difference is that nonrefereed reports are not subjected to this level of review. All research is and should be subject to critical review. Refereed articles have undergone this process, whereas nonrefereed articles leave that judgment purely to the reader's discretion.

As an educational researcher myself—and, perhaps more important, as a professional educator—I strongly believe that you owe it to yourself, and to your practice as a professional educator, to be educated in your profession.

EDUCATORS AS RESEARCHERS

The act of studying and learning about the educational research process is valuable to your professional life as an educator, regardless of your work setting. It is vitally important for educators, at all levels, to have a sound understanding of research methods for two basic reasons. First, at some point in your professional career, it may be highly beneficial for you to design and conduct, or otherwise become involved in, some sort of research study, as we discuss momentarily. Second, having a foundational understanding of the research process enables you to be a more discriminating consumer of published research studies. This is important when it comes to identifying a particular study's strengths and weaknesses and determining the extent to which its findings may, or may not, apply to you and your setting.

Additionally, there are several common purposes—or *practical applications*, if you will—for studying educational research. These are just a few of the more common ways studying educational research can inform your professional practice:

- Writing grant proposals (including their evaluation components)
- Completing theses and dissertations
- Reading primary and secondary sources more critically
- Reviewing professional literature as a means of thinking more critically, and possibly more reflectively, about issues and problems related to your setting (e.g., your classroom, your students, your subject matter)
- Conducting more formal research projects

You may be wondering, in light of the required steps and processes considered so far, whether genuine research can be carried out by educators and, if so, whether such research can truly shed light

on topics of educational concern. Rest assured that educators can, even while busy on the job, do research of quality and importance. For some time now, practical inquiry undertaken by educators is considered more likely to lead to classroom change than formal research conducted by research specialists (Richardson, 1994). Radebaugh (1994) contends that educational research should not be left to experts, but should more extensively involve educators; educator-conducted research is especially powerful in shedding light on topics, such as educators' personal and professional lives and the problems educators regularly encounter in their work (Fleischer, 1994; Goodson, 1994). I am a firm believer in the fact that educator-led research can be an extremely empowering professional activity.

Thus, be assured that not only can you involve yourself successfully in meaningful educational research, but any investigation you conduct likely is more beneficial than formal research to your work in education, and probably more beneficial to other educators as well. You may even wish to involve your students as coresearchers in your investigations, which would logically invite them to take more responsibility for their own learning.

DEVELOPMENTAL ACTIVITIES

1. List and briefly describe at least five things within your classroom, school, or other educational setting that interest you and that you might want to pursue further. These might be problems you have become aware of, aspects of your practice you want to improve, or issues that concern you as a professional educator.
2. Based on what you learned in this chapter about educational research, for each of the problems or issues you generated earlier, judge the extent to which you believe that each might be appropriate for an educational research study.
3. Based on your new knowledge, briefly discuss how you believe that educational research can prove to be personally and professionally beneficial to you. What concerns do you have about its potential shortcomings?
4. Sit with one or two educational colleagues (preferably ones who are not in this course with you) and discuss educational research. Are their opinions toward research similar to or different from yours? Do they believe that educational research can benefit them, either personally or professionally (or both)? What concerns about educational research do they express to you?
5. Do you believe that educational research can benefit your students, or students in general? Why or why not?

SUMMARY

- Research, in general, is important to how we function as a successful and productive society.
- The primary goal of virtually any research study is to find answers to our questions.
  - Typical sources for answering our questions (i.e., tradition, authority, and common sense) usually fall short in helping us find those answers.
- The scientific method is a systematic, step-by-step strategy used to answer questions and resolve problems.
- The main steps in the scientific method are as follows:
  - Clarify the main question inherent in the problem.
  - State a hypothesis.
  - Collect, analyze, and interpret information (i.e., data) related to the question.
  - Form conclusions derived from the interpretations of the analyses.
  - Use the conclusions to verify or reject your hypothesis.

- Educational research is a process that involves applying the scientific method to educational problems and phenomena.
- As a process, all educational research studies share many essential characteristics.
- Educational research relies on either deductive or inductive reasoning.
- Data are collected on variables, and those data are analyzed to test hypotheses or answer research questions.
- Research designs describe the plan to be used by the researcher to carry out the actual study.
  - Quantitative research designs can be either experimental or nonexperimental.
  - Qualitative research designs involve a broader, more holistic approach to collecting and analyzing data.
  - Mixed-methods research designs, along with action research, typically involve the collection and analysis of both quantitative and qualitative data.
- The main steps in the process of conducting educational research are as follows:
  - Identification of an existing problem
  - Clarification of the specific problem
  - Formulation of research question(s)
  - Review of related literature
  - Development of data collection procedures
  - Specification of data analysis procedures
  - Statement of the findings resulting from data analysis
  - Development of conclusions and recommendations related to the question(s)
- Becoming familiar with your field of study by reading research articles is one of the best ways to begin your future as an educational researcher or consumer of research.
- Some of the most meaningful and beneficial research in education results from studies conducted by practicing educators.

KEY TERMS

action research studies
case studies
causal-comparative studies
comparative studies
control group
correlational studies
deductive reasoning
dependent variable
descriptive statistics
descriptive studies
educational research
ethnographic research
ex post facto studies
experimental group
experimental research
grounded theory research
hypotheses
independent variables
inductive reasoning
inferential statistics
logico-inductive analysis
mixed-methods research designs
nonexperimental research
phenomenological studies
population
quasi-experimental designs
refereed research report
research design
research problem
research questions
sample
scientific method
statistical significance
triangulation
variables